# Big Data in Health Care: Challenges and Opportunities

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***Abstract*—** The last decade has seen huge advances in the amount of data we routinely generate and collect in pretty much everything we do, as well as our ability to use technology to analyze and understand it. The intersection of these trends is what we call "Big Data" and it is helping businesses in every industry to become more efficient and productive. The healthcare industry is using Big to predict epidemics, cure disease, improve quality of life and avoid preventable deaths. With the world's population increasing and everyone living longer, models of treatment delivery are rapidly changing, and many of the decisions behind those changes are being driven by data.

***Keywords*— *Big Data, volume*, velocity, variety, varicity*;***

## I. BIG DATA IN HEALTH CARE

Big data analytics is turning out to be one of the toughest undertakings the healthcare industry. For healthcare organizations that successfully integrate data-driven insights into their clinical and operational processes, the rewards can be huge. Healthier patients, lower care costs, more visibility into performance, and higher staff and consumer satisfaction rates are among the many benefits of turning data assets into data insights.

## II. CHALLENGES FACED BY ORGANIZATIONS

### *A. VOLUME – HOW MUCH DATA?*

Healthcare data tends to be on the useful side. Clinical notes, claims data, lab results, gene sequences, medical device data, and imaging studies are information-rich, and become even more useful when combined in novel ways to produce brand new insights. Organizations must develop storage techniques, either on premise or in the cloud, to handle the amount of data at hand. They must also ensure that their infrastructure can keep up with the next V on the list without slowing down critical functions like EHR access or provider communications.

### *B. VELOCITY – HOW QUICKLY IS THE DATA BEING CREATED, MOVED, OR ACCESSED?*

Healthcare information accounts for a respectable proportion of the data gushing through the world's wires, and the figures will continue to rise as the Internet of Things, medical devices, genomic testing, machine learning, natural language processing, and other novel data generation and processing techniques evolve. Data such as patient vital signs in the ICU, must update in real-time at the point of care and be displayed immediately. In these cases, system response time is an important metric for organizations, says Laney, and may be a competitive differentiator for vendors developing such products. Trying to make every data stream fast is not an appropriate use of resources, and may not even be possible, but defining which data sources are important to access in days or weeks instead of months can certainly give providers an edge with quality reporting and practice improvement.

### *C. VARIETY – HOW MANY DIFFERENT TYPES OF SOURCES ARE THERE?*

Meaningful data comes in all shapes and sizes, and conventional wisdom says that the more types of information you can smash together, the richer the insights will be. Data sets simply cannot be compared when they are held in separate locations or in incompatible formats, limiting the insights providers can gain about their patients or operations.

Health IT developers are starting to break down the problem by enlisting the help of application programming interfaces (APIs) and new standards such as FHIR, both of which make it easier to vault over walled gardens and raise the variety quotient.

### *D. VERACITY – CAN WE TRUST THE DATA?*

The veracity of a dataset is difficult to verify, but providers cannot utilize insights that may have been derived from data that is incomplete, biased, or filled with noise. Providers are locked in a constant struggle to boost their levels data integrity and data quality, no easy feat when so many systems allow free text or other unstructured inputs. Data governance, and its close companion information governance, is key strategies that healthcare organizations must employ to ensure that their data is clean, complete, standardized, and ready to go.

## III. OPPORTUNITIES OF BIG DATA IN HEALTHCARE

Application of Big Data technologies would benefit many areas in health care industry. Healthy living (prevention, health promotion) Lifestyle support Big Data technologies could help to provide more effective tools for behavioural change, improve quality of care, managing population health, early detection of diseases, data quality, structure, and accessibility, improve decision making, cost reduction, patient-centric care, enhances personalized medicine, globalization, fraud detection, and health-threat detection.

### *A. Improve Quality of Care*

Big data offers an ability to predict outcomes using the available primary or historical data and provide proof of benefit that could change established, industry-wide standards of care, as in [3]. Leveraging technology at the patient end can also help with medication adherence, in [3]. This will most certainly play an important role in improving outcomes [7],[5] and improve the health-related quality of life. This will also assist in analysing real-time resource utilization productivity [5]. Quality can also be improved by reducing the rates of readmissions, increasing operational efficiencies, and improving performance [1],[4],[5].

### *B. Managing Population Health*

Big data analytics define populations at a finer level of granularity than has ever been previously achieved [1], [9]. It can help in managing the overall health of a population as well as specific individual health [5], [9]. Big data can enable population health management from a local or global perspective. This capability becomes more salient from the global perspective when considering the aging of the population and age-related health issues shared by many populations and subpopulations, many of which are underserved [6], [11].

### *C. Early Detection of Diseases*

Big data allows for the early detection of diseases, which aids in clinical objectives related to achieving improved treatments and higher patient outcomes [2], [3], [4], [5], [9]. Along with early detection, big data analytics can also help in the prevention of a wide range of deadly illnesses and personalized disease management and monitoring [2]. It enables to track healthy behaviours and helps patients in monitoring their respective conditions [3], [6]. This capability holds great potential when faced with either age-related diseases, or worldwide health issues such as cardiology [2], [10].

### *D. Data Quality, Structure, and Accessibility*

New knowledge can then be generated from high volumes of effective data, enabling reuse of the data [6], [9]. Open-source technology increases accessibility to and transparency of the data [3]. Finally, data quality can be maintained using analytics to get rid of unnecessary information.

### *E. Improve Decision Making*

Big data enables appropriate use of evidence-based medicine and helps health care providers make more informed decisions [2], [4], [5], [9]. This, in turn, improves the quality of care provided to the patients [10]. Remote monitoring, patient profile analytics, and genomic analytics are examples of other applications that influence the decision-making process [3], [5].

Decision-making process can be highly optimized by the availability of accurate and up-to-date information, as decision making is influenced by the generation of new practices and treatment guidelines within clinical research. Allowing big data to influence decision making will allow for a faster and simpler process. This is done by either supporting or replacing human decision making.

### *F. Cost Reduction*

The decrease in cost of the elements of computing, such as storage and processing, leads to a decrease in the cost of data-intensive tasks [7], [5]. Savings will be realized through more cost-effective treatments and monitoring to improve medication adherence [3] and through the reduction of costly transportation costs, as is experienced in cardiology [ 2], [4], [11].

### *G. Patient-Centric Care*

Increasing the use of technology is slowly changing the direction of the health care sector from disease-centric care toward patient-centric care [1]. Big data will play a significant role in this transformation [8]. It will allow the information to be delivered to patients directly and empower them to play an active part in their care [1] ,[9]. When patients are provided with the appropriate information, it will influence their decision making and allow them to make informed decisions [5].

### *H. Enhancing Personalized Medicine*

With the use of big data, the objectives of personalized medicine can be translated into clinical practice [1], [3]. Access to and processing of large volumes of data should enable a personalized patient-specific record of risks of disease [3], [6]. Big data applications aim to make this process more efficient.

### *I. Globalization*

Big data will actively help in disseminating the knowledge acquired from the data collected [2], [9]. Big data plays an active role in leveraging the practices and knowledge not only regionally but globally [4], [9]. By globalizing data, it is made more widely accessible and providers may access new information from all regions [2].

### *J. Fraud Detection*

One of the most significant benefits offered by big data is that it is instrumental in detecting fraud in an efficient and effective manner [5]. For example, the unauthorized use of specific user accounts by third parties can be minimized.

### *K. Health-Threat Detection*

Big data offers opportunity for improving capabilities of threat detection quickly and more accurately. This can be especially beneficial for government use [2].

## IV. CONCLUSION

The field of healthcare is very vast and also it has immense impact on the society. In this paper we reviewed some of the challenges and opportunities of Big Data related to healthcare. We thus conclude that health care data is crucial to the individuals and proper measure should be taken according to the type of information.

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